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them under a title which correctly describes the observer's purpose in making them—e. g. "measures for the proper motions of faint stars."

Finally, I would repeat that it is not essential to have a definition of a double star which shall include every possible physical system. Very little harm will be done if an occasional binary is overlooked for a century or two; such oversight, indeed, is bound to occur in any event. But it does seem desirable, in the interest of clearness and precision, to substitute for the many arbitrary ones now in use, a single definition that is practical even if not ideal.

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## PLANETARY PHENOMENA FOR JULY AND AUGUST, 1911.

By MALCOLM McNEILL.

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### PHASES OF THE MOON, PACIFIC TIME.

First Quarter..	July 3, 1 <sup>h</sup> 20 <sup>m</sup> A.M.	First Quarter..	Aug. 1, 3 <sup>h</sup> 29 <sup>m</sup> P.M.
Full Moon ....	" 11, 4 53 A.M.	Full Moon ....	" 9, 6 55 P.M.
Last Quarter ..	" 18, 9 31 P.M.	Last Quarter ..	" 17, 4 11 A.M.
New Moon ...	" 25, 12 12 P.M.	New Moon ....	" 23, 8 14 P.M.
		First Quarter ..	" 31, 8 21 A.M.

The Earth reaches its greatest distance from the Sun on July 2d, 11 P. M., Pacific time.

*Mercury* passes superior conjunction with the Sun on July 3d and becomes an evening star. It reaches its greatest east elongation on August 13th, and by the end of that month has nearly reached inferior conjunction. From the middle of July to the middle of August it does not set until an hour or more after the Sun, so that it may be seen in the evening twilight under favorable weather conditions. Eastern elongations of *Mercury* after the middle of the year do not generally give a good opportunity for observations, but the present greatest east elongation,  $27^{\circ} 26'$ , is an unusually large one, as it occurs on the same night as perihelion for the planet; so there is a fair chance of seeing the planet as an evening star for a few days before and after August 1st.

*Venus* remains an evening star, setting rather more than two and one-half hours after sunset on July 1st, but the interval

shortens rapidly, and is not much more than fifteen minutes at the end of August. *Venus* reaches greatest east elongation from the Sun,  $45^{\circ} 29'$ , on July 7th, and then begins to approach the Sun, with continually increasing speed, until it reaches inferior conjunction early in September. Its actual distance from the Earth is also diminishing very rapidly, and there is therefore a large increase in brightness until a time about halfway between greatest elongation and inferior conjunction. This occurs on August 10th, and for some weeks about that time the planet will be bright enough for naked-eye view in full daylight. After this time *Venus* will be nearly between us and the Sun, and only a small part of the illuminated half will present itself to our view, so its light will fall off rapidly.

*Mars* rises considerably earlier, at about 12:30 A. M. on July 1st and at about 10 P. M. on August 31st. Its motion during the two months is about  $37^{\circ}$  eastward and  $12^{\circ}$  northward from the constellation *Pisces* through *Aries* and into *Taurus*. At the end of the period it is about  $5^{\circ}$  south of the *Pleiades* group in *Taurus*. On the evening of August 16th it passes north of *Saturn* only  $21'$ , about two thirds of the Moon's apparent diameter. *Mars* reaches perihelion on July 1st, four months and more from the time of opposition. The coming opposition will therefore not be a favorable one for viewing the planet as compared with those where the times of opposition and perihelion are near together. Its distance from the Sun diminishes from 108,000,000 to 77,000,000 miles, and its brightness by the end of August will be nearly one half of the brightness at opposition in November.

*Jupiter* is in good position for observation in the evening sky. It sets at about 1 A. M. on July 1st, and at about 9 P. M. on August 31st. It remains in the constellation *Libra*, and after moving very slightly westward it begins to move eastward on July 3d, covering a distance of  $5^{\circ}$  eastward and  $2^{\circ}$  southward by the end of August.

*Saturn* rises at about 1:30 A. M. on July 1st and at about 9:45 P. M. on August 31st. It is on the border line of the constellations *Aries* and *Taurus*, and moves about  $3^{\circ}$  eastward and northward during the month. Its conjunction with *Mars* on August 16th has already been mentioned. The apparent

shape of the rings as seen in the telescope remains practically the same.

*Uranus* comes to opposition with the Sun on July 20th, and is therefore above the horizon most of the night during the two months. It is retrograding (moving westward) slowly along the border-line between *Sagittarius* and *Capricornus*, and, unfortunately, there is no good naked-eye star near it so as to afford a means of identification.

*Neptune* is in the evening sky until July 14th, but too close to the Sun for even telescopic observation. It then passes conjunction and becomes a morning star, rising by the end of August shortly before 2 A. M. It remains in the constellation *Gemini*.

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## PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1911.

By MALCOLM McNEILL.

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### PHASES OF THE MOON, PACIFIC TIME.

Full Moon ... Sept. 8, 7 <sup>h</sup> 57 <sup>m</sup> A.M.	Full Moon ... Oct. 7, 8 <sup>h</sup> 11 <sup>m</sup> P.M.
Last Quarter . " 15, 9 51 A.M.	Last Quarter .. " 14, 3 46 P.M.
New Moon ... " 22, 6 37 A.M.	New Moon ... " 21, 8 9 P.M.
First Quarter.. " 30, 3 8 A.M.	First Quarter .. " 29, 10 41 P.M.

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The second of the two eclipses of the year is an annular eclipse of the Sun on October 21st. No part of the eclipse will be visible from any part of the Western Hemisphere. The path of central eclipse runs from the Aral Sea southeast through Asia and ends in the Pacific Ocean northeast of Australia.

The Sun crosses the equator from north to south and autumn begins September 23d, 8 P. M., Pacific time.

At the beginning of September *Mercury* is an evening star, too near the Sun for naked-eye view. It passes inferior conjunction and becomes a morning star on the morning of September 9th. It then moves rapidly out toward greatest west elongation, 17° 52', which it reaches on the morning of September 25th. This is a small greatest elongation, as the planet passes perihelion less than twelve hours later, but it will then rise about an hour and one half before sunrise and can be seen